IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	T. Yamaguchi et al.	Attorney Docket No.:	NAII123496
Application No.:	10/506720	Art Unit:	1795 / Confirmation No: 5176
Filed:	March 10, 2005	Examiner:	J.J. Rhee
Title:	ELECTROLYTE FILM AND SOLID POLYMER FUEL CELL USING THE SAME		

RESPONSE SUBMITTED WITH RCE

Seattle, Washington 98101

October 23, 2008

TO THE COMMISSIONER FOR PATENTS:

In response to the Office Action mailed April 24, 2008, please reconsider and withdraw the rejection in view of the following remarks.

Claims 1-10 are pending in the application and stand rejected. Reconsideration and allowance of Claims 1-10 in view of the following remarks is respectfully requested.

Rejection of Claims 1-10 Under 35 U.S.C. § 103(a)

Claims 1-10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over EP 1202365, issued to Yamaguchi et al. (hereinafter "the Yamaguchi reference") in view of U.S. Patent No. 5,910,357, issued to Hachisuka et al. (hereinafter "the Hachisuka reference"). Withdrawal of the rejection is respectfully requested for the following reasons.

Claim 1 relates to an electrolyte membrane. Claims 2-10 depend from Claim 1.

Admitting that the Yamaguchi reference fails to disclose that the porous substrate comprises a crosslinked second polymer wherein the second polymers are crosslinked with one another and a third polymer has a carbon-carbon double bond, the Examiner states that the Hachisuka reference teaches a porous substrate comprising a crosslinked second polymer and a carbon-carbon double bond-containing third polymer. The Examiner concludes that it would

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have been obvious to a person skilled in the art to combine the teachings of the Yamaguchi and Hachisuka references to arrive at the claimed invention. Applicants respectfully disagree.

There is no reason for a person skilled in the art to combine Yamaguchi's teaching of the use of a non-swelling membrane with Hachisuka's shape memory polymer that changes shape to provide the electrolyte membrane of the claimed invention.

The claimed invention is directed to an electrolyte membrane comprising a porous substrate. As noted in the response mailed December 20, 2007, by using two specific types of polymers, i.e., a crosslinked polyolefin and a polymer having a carbon-carbon double bond, as the porous substrate, the claimed invention achieves several desirable features including no or reduced change in the surface area of the electrolyte membrane.

The Yamaguchi reference discloses an electrolyte membrane made of a porous substrate that does not swell substantially with methanol and water. Throughout the reference, Yamaguchi stresses the importance of a porous substrate having swell-resistance against organic solvent and water and being endurable in a high-temperature environment. See, for example, Abstract; Col. 2, lines 1-4 and 22; Col. 3, lines 22-24; Col. 6, lines 56-57; Col. 9, lines 1-3, 20, and 40-41. As noted in applicants' specification at page 2, lines 9-11, it is desirable to avoid a change in porous substrate surface area when the porous substrate is wetted. Swelling of a membrane can be undesirable because it increases the surface area of the membrane. Yamaguchi does not disclose or suggest the use of a shape memory polymer that changes shape of the kind described in Hachisuka. In fact, Yamaguchi teaches away from using a polymer that changes shape because Yamaguchi describes swelling is undesirable.

The Hachisuka reference discloses a shape memory polymer that changes shape and its use as a separation membrane. Hachisuka describes that the pore size (e.g., surface area) of the shape memory polymer membrane can be reversibly changed in response to factors including

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pressure, humidity, pH, photoreaction, electricity, chelation, and redox reaction (Col. 2, lines 57-61). Hachisuka also describes that the pore size of a membrane made from the shape memory polymer can be reversibly changed by temperature or solvents. All of the shape memory polymers of Hachisuka, including those that transition from a glass state to a rubber state as the temperature increases, change shape. The changing of shape when shape memory polymers undergo a transition from a glass state to a rubber state is reported in Lendlein et al., "Shape Memory Polymers," *Aangew Chem. Int. Ed. 41*:2034-2057, 2002, **Exhibit A**. According to Hachisuka, a reversible shape change in the shape memory polymers is necessary so that the pore size of the membrane can be reversibly changed, thus permitting fouled pores to be easily unfouled.

As noted above, Yamaguchi teaches the undesirability of using polymers that swell, i.e., change shape. One skilled in the art reading the Yamaguchi reference and its teaching away from the use of a polymer that changes shape would not be motivated to use polymers that change shape, such as the shape memory polymers of Hachisuka. For this reason, Yamaguchi and Hachisuka are not properly combinable and, therefore, a *prima facie* case of obviousness with respect to the subject matter of Claim 1 does not exist.

Furthermore, one of ordinary skill in the art would not be motivated to use the polymers of Hachisuka that change shape in the electrolytic membrane of Yamaguchi for the following reasons. As noted above, Yamaguchi teaches away from the use of an electrolytic membrane that swells.

As described above, Hachisuka describes shape memory polymers that change shape in response to factors such as temperature and solvents. The temperature factor results in a change of shape as a result of a transition from a glass state at room temperature to a rubber state at a temperature above room temperature. The solvent factor results in a change in shape of the